Research on the Teaching Reform of Higher Vocational Mathematics Curriculum Driven by Big Data in the New Era

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Abstract: In recent years, with the continuous deepening of China's education system reform, vocational education has entered people's vision and played an increasingly important role in higher education and social talent cultivation. Mathematics, as a key component of the higher vocational education system, also faces many challenges and new changes in the process of educational reform. This requires vocational colleges to actively explore the reform path of mathematics curriculum teaching, in order to strengthen teaching effectiveness. This article first explores the problems of uneven students' mathematical foundations, rigid and lagging teaching modes, and lack of cultivation of students' mathematical knowledge application abilities in vocational mathematics curriculum teaching. Secondly, the role of big data technology in teaching content, teaching effectiveness, and other aspects is elucidated. Finally, measures are proposed to optimize teaching content, innovate teaching methods, add teaching practices, and transform the roles of teachers and students, in order to provide some reference and inspiration for relevant vocational college teachers to fully utilize big data technology to drive the reform of mathematics curriculum teaching and improve teaching effectiveness.

1. Introduction

Big data technology is an important product of innovation and progress in China's scientific and technological field, with significant advantages in processing large amounts of data information. Reasonably applying it to the reform activities of vocational mathematics curriculum teaching can fully leverage the big data-driven function, enrich teaching content, innovate teaching forms, and optimize teacher-student relationships, thereby effectively improving the effectiveness of mathematics curriculum teaching reform and providing higher quality mathematics education services for vocational students [1]. However, looking at the current situation of mathematics curriculum teaching in various vocational colleges in China, there are still some vocational colleges and teachers who are influenced by traditional educational concepts and basic environments, and there are many problems that limit the role of big data technology in mathematics curriculum teaching reform. Therefore, how to promote the reform of mathematics teaching curriculum under the drive of big data has become an urgent educational problem that vocational colleges need to solve in the new era.

2. Problems in Current Teaching of Mathematics Courses in Higher Vocational Education

2.1 Students' Lack of a Solid Foundation in Mathematics and Their Low Enthusiasm for Learning

Compared to regular higher education institutions, the enrollment scope of vocational colleges is relatively broad, including not only general enrollment for exams, but also single enrollment. Based on this enrollment and education model, the student population of vocational colleges presents characteristics such as uneven foundations, differences in literary literacy and learning concepts. Taking the teaching activities of vocational mathematics courses as an example, some students have a solid foundation in mathematics and a strong personal interest in learning mathematics [2]. This

type of student tends to be more active in the teaching activities of vocational mathematics courses, and has a better understanding and absorption of the knowledge taught by teachers. However, some students have weak mathematical foundations, poor learning acceptance abilities, and even a very small number of students have a resistance to mathematics. These students rarely interact with teachers and ask questions in the teaching of vocational mathematics courses. The uneven mathematical learning ability and foundation among student groups to some extent affect the teaching effectiveness of vocational mathematics courses.

2.2 Rigid and Lagging Teaching Mode

Due to China's long-standing emphasis on exam-oriented education, most teachers and students have developed a utilitarian mentality, believing that the primary goal of learning is to achieve ideal exam results. Under the influence of this one-sided educational cognitive concept, some vocational colleges' mathematics curriculum teaching activities mainly focus on theoretical knowledge explanation, forcibly imparting knowledge to students. On the one hand, vocational mathematics teachers have overlooked the students' dominant position in teaching activities and their learning demands. The current process of teaching informatization construction in most vocational colleges is relatively slow, and teachers' information skills are limited, so it is impossible to use information technology to enhance teaching effectiveness in vocational mathematics courses. On the other hand, students become overly dependent on teachers and can only solve mathematical problems according to the teacher's problem-solving ideas. Once the mathematical problem changes form, they will have no way to start. The rigid and monotonous teaching mode affects students' enthusiasm for learning mathematical knowledge, limiting the formation and development of their mathematical learning ability and flexible application of knowledge [3].

2.3 Students' Poor Ability to Apply Mathematical Knowledge

The main talent training goal of vocational colleges is to cultivate specialized and high-quality frontline talents for various industries. Therefore, the teaching activities organized and carried out focus on professional skills, ethics, and other content, neglecting the educational importance of vocational mathematics as a subject, which has caused many problems in the teaching activities of vocational mathematics courses. Specifically, some colleges use mathematics textbooks that are not regular versions, but have made certain deletions and compressions of undergraduate textbook content based on the mathematical foundation level of vocational college students. Although the edited textbook also contains a large amount of key and difficult knowledge, it has not achieved organic integration with other disciplines, resulting in students only mastering superficial knowledge, unable to flexibly apply the learned knowledge to solve mathematical problems in real life. It limits the formation and development of mathematical abilities of vocational college students, ultimately leading to the teaching of college mathematics courses becoming a mere formality.

3. Driving Role of Big Data Technology in the Reform of Mathematics Curriculum Teaching in Higher Vocational Education

Firstly, it is conducive to enriching the teaching content. Under the drive of big data, promoting the reform of vocational mathematics curriculum teaching can break the limitations of traditional textbooks and enrich teaching content. For example, introducing financial data information into mathematics teaching, guiding students to apply their learned knowledge for data analysis, modeling, and so on. Through real cases, students can not only recognize the practical value of mathematics in real life, but also exercise their ability to apply mathematical knowledge to solve practical problems [4]. Secondly, it is conducive to enhancing teaching effectiveness. On the one hand, big data technology can help teachers accurately grasp students' learning situations, such as the duration of online learning, the answering situation after MOOCs, and the number of online interactions with teachers. By analyzing the above data, teachers can grasp students' learning situation and adjust the direction of mathematics curriculum teaching reform accordingly. On the other hand, big data technology can objectively evaluate students' learning abilities and identify

their knowledge weaknesses. At this point, teachers can focus their teaching on the content that students have not understood or cannot fully grasp, in order to improve teaching effectiveness.

4. Strategies for Teaching Reform of Mathematics Courses in Higher Vocational Education Driven by Big Data

4.1 Base on Students' Learning Situation, Optimize Teaching Content

To effectively strengthen the effectiveness of mathematics curriculum teaching reform, relevant vocational colleges should focus on students' basic learning situation and the development trend of big data technology, reasonably optimize mathematics teaching content, ensure that the teaching content keeps pace with the times and meets the mathematical ability requirements of society for vocational talents. At the same time, it is necessary to expand and enrich the teaching content, fully stimulate students' enthusiasm for learning vocational mathematics. Firstly, colleges can introduce more practical cases related to big data technology in mathematics teaching, using real data as the research object, to deepen students' understanding and mastery of course knowledge. For example, using big data technology to collect market research data, social media data, financial data, etc. related to course content can enable students to have a more concrete understanding of mathematical theories, recognize the practical value of mathematical knowledge in daily life, and gradually cultivate the mathematical thinking ability of vocational college students. Secondly, colleges can leverage big data technology to enhance the visibility of mathematical content. Presenting various theoretical knowledge in the form of charts, mind maps, etc. can not only stimulate students' interest in learning, but also facilitate their clearer analysis of the connections and patterns between mathematical knowledge, enhancing their mathematical learning ability. Thirdly, in addition to basic mathematics courses, vocational colleges can offer elective courses for students and provide them with more in-depth opportunities for big data analysis and application, teaching students more advanced data analysis methods, calculation methods, etc., and cultivating high-end mathematical talents for society.

4.2 Introduce Technical Support and Innovate Teaching Methods

Innovating teaching methods is a key focus of the reform of mathematics curriculum in higher vocational education in the new era, fully stimulating students' learning enthusiasm and classroom interaction and participation initiative, thereby creating a good teaching atmosphere and laying a solid foundation for students to explore and flexibly apply mathematical knowledge. Firstly, utilizing big data technology can concretize abstract mathematical concepts. In the past, vocational mathematics courses focused on imparting theoretical knowledge, and students could only passively absorb knowledge from teachers. Their analysis and understanding of mathematical knowledge were relatively superficial. Fully leveraging the driving force of big data can concretize and process abstract mathematical concepts. Taking the concept of functions as an example, teachers can use big data visualization tools to draw function images, guiding students to understand the characteristics and variation patterns of functions from the function images. Secondly, introduce new teaching models such as "flipped classroom" and Chaoxing MOOCs, and organize students to use big data technology to preview the upcoming content before class. Teachers can use platforms such as WeChat and QQ to interact and communicate with students in a timely manner, eliminating students' doubts about the learned content before class. This can better balance offline teaching time and improve the effectiveness of mathematics teaching. Thirdly, introduce computer teaching experiments to enhance students' mathematical modeling and data processing abilities. For example, in the teaching activities of vocational mathematics courses, big data is used to demonstrate abstract mathematical calculations and symbol processing methods to students, then assign practical tasks to students and guide them to improve their ability to apply mathematical knowledge in groups.

4.3 Add Teaching Practice to Cultivate Students' Mathematical Thinking Ability

Firstly, design a data analysis project that allows students to personally experience the

operational steps of data collection, cleaning, analysis, and visualization processing. Through practical operation, students can master the methods of data collection and processing, and gradually learn to use statistical and mathematical modeling methods to mine and analyze data. During this process, students can also experience the joy of learning mathematical knowledge and stimulate their enthusiasm for learning through personal practical operations. Secondly, design practical projects based on the teaching content to encourage students to apply their mathematical knowledge to solve practical problems, such as design a "financial stock prediction project", organize students to adapt to statistical knowledge to analyze historical data of a certain financial project, and then use mathematical modeling to reasonably speculate on the future development trend of a certain financial stock. Thirdly, strengthen teamwork in practical projects. During the process of organizing practical projects, teachers can divide students into multiple groups and assign them practical tasks. Through teamwork, not only can students develop a sense of unity, but they can also be encouraged to think and solve problems proactively.

4.4 Transform the Roles of Teachers and Students, Stimulate Students' Interest in Learning

Under the drive of big data, to promote the reform of vocational mathematics curriculum teaching, teachers should respect students' learning subject status, effectively play their guiding and guiding functions, and strengthen the effectiveness of vocational mathematics curriculum teaching reform. Firstly, in the traditional teaching mode, teachers are in a dominant position, while students are in a passive position. Under the drive of big data, teachers should use various data cases, practical projects, etc. to guide students to actively explore and think, encourage students to raise doubts, express their opinions boldly, and summarize experiences from teaching projects, thereby cultivating students' mathematical thinking ability. Secondly, strengthen positive interaction with students. For example, in mathematics course teaching, big data technology is used to randomly call names, and students are asked to create teaching materials related to this lesson with the theme of "I am a teacher" and explain them on stage. Creating a good classroom atmosphere through interaction between teachers and students can stimulate students' subjective initiative in learning.

5. Conclusion

In summary, fully leveraging the driving role of big data technology in the reform of vocational mathematics curriculum in the new era has strong practical significance for improving the quality of vocational mathematics curriculum teaching, strengthening the effectiveness of teaching reform, and cultivating students' mathematical learning and application abilities. Playing a big data-driven role in the reform of vocational mathematics curriculum teaching can innovate teaching forms, enrich teaching content, enhance teacher-student interaction, fully mobilize the enthusiasm and subjective initiative of vocational students in mathematics learning, and improve students' learning effectiveness. Based on this, relevant vocational colleges in the new era should actively explore the problems existing in the current reform of mathematics curriculum teaching, and fully utilize the driving role of big data technology in teaching reform. By focusing on students' learning situations, optimizing teaching content, introducing technical support, innovating teaching methods, adding teaching practice to cultivate students' mathematical thinking ability, transforming the roles of teachers and students, stimulating students' interest in learning, and other measures, the reform of mathematics curriculum teaching can be promoted.

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